Successful Technology Transfer to Indigenous Peoples: A Literature Search

Megan McEneely

DOE Energy Research Undergraduate Laboratory Fellowship Program

James Madison University

National Renewable Energy Laboratory

Golden, Colorado 80401

August 17, 2000

Prepared in partial fulfillment of the requirements of the Office of Science, DOE ERULF Program under the direction of Ian Baring-Gould in the International Division at the National Renewable Energy Laboratory.

Participant: _____
Signature

Research Advisor: _____
Signature

Table of Contents

Abstract

Successful Technology Transfer to Indigenous Peoples: A Literature Search. MEGAN MCENEELY (James Madison University, Harrisonburg, Virginia 22807) Ian Baring-Gould (National Renewable Energy Laboratory, Golden, Colorado 80401).

Many government, non-government, and commercial organizations are currently involved with development in less developed areas of the world, often inhabited by indigenous peoples. Energy is a primary concern in these areas, as the addition of electricity can increase the standard of living, and improve health, education, and the potential for economic growth. Sometimes the transfer of energy technologies is not successful. To discover why this is so, a literature search was conducted to explore new technologies that were integrated into indigenous populations. From these, some of the issues associated with technology transfer were uncovered. It was found that communication between the developer and the community is invaluable. The developer must determine whether or not a community wants new technology, the intended uses of the technology to avoid future disappointment, and understand the local culture as much as possible. Independent of the particular technology, clear communication and a strong understanding of the community on the part of the developer are the two most urgent issues for successful technology transfer.

Research Category
ERULF: Other

School Author Attends: James Madison University
DOE National Laboratory Attended: National Renewable Energy Laboratory
Mentor's Name: Ian Baring-Gould
Phone: (303) 384-7021
e-mail Address: Ian_Baring-Gould@nrel.gov

Presenter's Name: Megan McEneely
Mailing Address: 1826K Putter Court
City/State/Zip: Harrisonburg, VA 22801
Phone: (540) 442-4416
e-mail Address: mceneeme@jmu.edu

Is this being submitted for publication? No
DOE Program: ERULF

Introduction

Indigenous peoples may be defined as the original inhabitants, or descendents of the original inhabitants, of a particular area. According to the 1993 *State of the World* prepared by the Worldwatch Institute, indigenous peoples live in remote areas of all seven continents, and are caretakers of their land. Their care of the land contributes to the sustained biodiversity in those areas, and has allowed their people to live in one place, often for thousands of years. However, the majority of indigenous peoples have been forced aside by outsiders and taken from the land they sustained for so long. The survival of native peoples is essential to the survival of all cultures and the earth, as their ecological knowledge may surpass that of modern science (Durning, 1993). Indigenous peoples often live in the most remote areas, furthest from the electrical grid and, therefore, have the least chance of grid connection. Typically, indigenous peoples are less developed economically and technologically, contributing to the likelihood that they are not connected to the grid.

Due to the distinct and often misunderstood cultures of indigenous peoples, integrating technology into these societies requires understanding the lifestyles of the people. Because each group of indigenous peoples has a different way of life, it is difficult to follow a blanket plan for technology integration. Rather, major issues must be addressed to tailor any application to a specific community. It would be beneficial to establish a list of the most important social issues associated with technology integration and use this as a basic guideline for establishing the best plan for integration. Since governments are likely to provide support to native populations, resources are often available for these projects. However, neither these funds nor the trust of the people are unlimited, and both are likely to be retracted in response to an unsuccessful project.

Therefore, it is important to understand the issues associated with and the implications of technology dissemination in indigenous communities.

The Village Power Program (VP) at the National Renewable Energy Laboratory (NREL) addresses the energy needs of world rural villages, home to approximately two billion people. If grid connection exists in these areas, it is often of poor quality, providing unreliable power to the villagers. The existence of power can increase the standard of living, and allow for improvements in health, education, and economic growth. VP exists to develop solutions to the problem of rural electrification (Flowers, 1997). The four primary areas in which it concentrates are technical assistance, applications, analytical modeling, and education.

Village Power 2000 is a conference sponsored by NREL, the World Bank, Winrock International, U.S. Agency for International Development, and UNDP/World Bank Energy Sector Management Assistance Programme. It will be held at the World Bank in Washington, D.C. in December 2000. The 2000 conference will bring together the donor community, government, non-government (NGO), and commercial organizations who have an interest in rural technology. This year, a workshop will be held addressing technology in indigenous populations. The goal is to foster discussion among the different stakeholders to trade information and lessons learned in this area. Ideally, this conference will prompt more thorough and constructive planning of indigenous technology diffusion, resulting in more successful development projects.

This research is a preliminary literature review in preparation for this workshop. It attempts to uncover some of the major issues involved, the major players, and previous lessons learned. The findings will be used in planning the workshop, especially to decide who should be included in the workshop, who has information on this subject, who has been doing work in this

area, and important topics of discussion. The end result is a productive workshop addressing the critical issue of indigenous peoples and their use of technology.

Methods

This research was conducted using Internet search engines, online databases and journals, and library catalogs. I used keywords such as "culture", "empowerment", "indigenous people(s)", "globalization", "quality of life", "development", "rural", "technology diffusion", and "technology adoption." I looked at Web pages maintained by various indigenous groups, as well as those of development agencies. The major difficulty was indigenous peoples rarely spoke about technology, and development groups seldom mentioned the social aspects of their work.

Results

Sources specifically relating to indigenous peoples were less abundant than were those relating to rural areas of developing countries. The findings are presented here in two separate sections. The "indigenous findings" section will summarize those findings where the authors clearly specified the material was about indigenous peoples. The "rural development" section includes works in which the authors either plainly spoke of rural areas of developing countries, or where it was not clear whether the communities in point were indigenous. The assumption was made that rural areas of developing countries have some properties in common with indigenous communities, as their cultures are similarly unfamiliar to the developers. Table 1 at the end of the text summarizes the results.

Indigenous findings

Lessons Learned

- B.J. Linquist and David Adolph cited a case in which an indigenous community in Kenya was interested in collaborating with their organization, the Intermediate Technology Development Group (ITDG), a group interested in different methods of technology transfer in development. They reported important insight to differences between Western thinking and indigenous thinking in terms of collaborating on a project. The ITDG met with the Yaa Galbo of northern Kenya to discuss animal health. A nomadic people living in one of the harshest parts of Kenya, their society thrives due to its organizational nature. One problem encountered was the precedence the Yaa placed on ritual celebrations. When the ITDG arrived on the night of a new moon, they had to wait two days until the ritual was completed before they could meet. Another time, upon arrival at the site, the ITDG found that the Yaa had moved, as the Yaa considered Thursday a good moving day. This required a whole day spent in search of the Yaa. The ITDG learned several lessons about an indigenous culture. First, there are parts of the culture that make it strong. For this reason, it is important to observe the community and its rituals and to respect these in making meeting or other plans. Also, the time required for decision-making must be respected. It took the Yaa three months to approve a plan to spend about $US30 to plant a hedge. These were issues that ITDG had to accept and accommodate. The Yaa, on the other hand, had to understand that the ITDG could not always make scheduled appointments due to travel difficulty, nor could they spend an unlimited amount of time at their site (Linquist & Adolph,1996).
- In a study of the Mentawaian peoples of Siberut Island, Meutia Swasono discussed the importance of developers understanding the local culture. The Mentawaians use their land in a

particular manner, with their *uma*, the main village, and their forest near each other. Their culture requires this layout of the land. Developers must understand this culture to understand that relocating the people to another area or changing the layout of their land would not be suitable (Swasono, 1997).

Cultural Response to Technology

- Another aspect of technology transfer is the reaction of different cultures to new technologies. In Canada, a handful of Dene community members decided to allow the Canadian Broadcast Company (CBC) to install satellite dishes to the dismay of the majority of the community. After this, community members were interviewed about the impact of TV on their lives. Teachers complained that the students learned English slang on TV, making it difficult to teach them proper English, and that the students stayed up too late at night and then fell asleep in school. Another educator complained that students did not find her teaching as dynamic as TV shows, and she felt like she had to put on a performance for the children to pay attention. A mother and writer felt that children became less creative and were more likely to watch TV than to play or read. An older woman discussed how even the women were influenced by the soap operas, calling each other on the telephone to discuss the shows. A discussion took place concerning the effects of TV on storytelling, the traditional family gathering time. There was concern that the storytellers were dying without passing their skills on to the next generation because they were too busy watching TV, leading to the demise of the oral history (Mander, 1991).
- Brett Westblade, from the University of Melbourne, Australia, worked in some indigenous communities and witnessed social changes related to technology. Before television and radio, people talked, shared stories, and spent time together. The introduction of video, however,

changed the structure of the family from an extended family to a nuclear family. Family and friends who wanted to use the equipment disturbed people with video in their homes, thus owners began locking their doors. On the other hand, video was not viewed negatively, as it was used to preserve the cultural dance and songs (email, July 25, 2000).

- Indigenous societies may feel threatened by the prospect of technology. A brief account of this is in an email written by Aanta Forsgren, a member of a Sami community in Sweden. The Samis rely on reindeer grazing for their survival; when companies came in and used the peat from their grazing lands, the Sami lifestyle was directly affected. Likewise, they objected to wind turbines that were to be installed nearby, but nevertheless, the turbines were installed. He claimed that no organizations of citizens were concerned with the well being of the Sami people. He said that the "Scandinavian phenomenon where the ideas of the former half of the 20th century that the natives shall be eradicated is embraced by most [people]" (email, July 22, 2000).

Rural Development

- Wendy Annecke, of the Energy and Development Research Centre at the University of Cape Town, South Africa, conducted a survey of two rural communities in South Africa that had recently received electricity. Her report details the social consequences, particularly the reduction of work for women and the informal educational benefits, of new electricity in these two villages. Many Maphephetheni residents purchased individual solar systems to power approximately three light bulbs and a small television or radio. Many residents in Cekeza received grid connection, and were able to purchase small stoves in addition to lights. In surveying the residents, she found that the greatest hardship among women was collecting wood for fires. Because of this, residents of Cekeza were more likely to state that electricity

made their lives easier. Women in Maphephetheni reported that they still had to collect the firewood, therefore, the greatest beneficiaries were the children, who had light for studying and could watch television. The absence of electricity for cooking was the most common complaint from the Maphephetheni women. Other available resources limited the benefits of electricity, such as the inability to bathe in hot water without having running water, and the inability to make hot morning meals without food. Almost all residents who received power were no longer afraid of the threat of fire resulting from candles (Annecke, 1999).

- A study of individual photovoltaic (PV) systems in Kenya was conducted exclusively of the private market, and was biased toward homes closest to urban areas, as these were the most accessible. The factors contributing to the dissemination of PV in Kenya according to the survey included increased domestic production of system components, decreasing world prices of PV modules, and the slow pace at which rural areas were connected to the grid. The factors holding back the widespread use of PV include politics, rising prices of components in Kenya, the depreciation of the currency, and rising inflation. When the systems were not working perfectly, few households blamed the PV for these problems; most recognized that the batteries and bulbs were bad, but the PV was fine. A lack of communication with the consumer before the sale about usage expectations caused some problems. According to the article, "this technology transfer has succeeded because concerned individuals and organizations worked with Kenyans for years to lay the foundation…environmental considerations alone were not enough… Simple economics and technical reliability are…the largest factors influencing the decision to invest in PV" (Acker & Kammen, 1996).
- The importance of involving the end users of any technology was emphasized in an article about mirte stoves in Ethiopia. These stoves are used to cook injera, a traditional bread of

Ethiopia. The traditional method of cooking it over a fire was harmful to the eyes and lungs of those in the house, and was a fire danger. A stove was developed specifically for baking this bread and its production and sale have been successful. The success was at least partially attributed to the fact that women participated in producing and installing the stoves and they were the main beneficiaries (Mirte Stoves, 1998).

- While integrating wind power into nomadic communities in Inner Mongolia, several successful techniques were used. First, trial and error resulted in success, when both stand-alone and community systems were used. The community systems did not succeed as readily as the individual systems, so the stand-alone systems were emphasized for future projects. They also found that advertising was not always necessary, as the majority of people found out about the technology by word-of-mouth. One of the most important factors in this government-introduced project was the widespread use of feedback loops across the whole project. Any complaints about the system were relayed to the manufacturers for improvements. The success of the feedback loops was attributed to three main factors: the diligence of the Science and Technology Commission in gathering information from the demonstration projects and relaying it to manufacturers, the manufacturers' motivation to improve the quality of their product, and the availability of expert research centers. The long-term commitment by all parties to this project has also aided its success (Scott, Batchelor, & Daoqi, 1999). The length of time from the start of the project until sales were sustainable was twenty years. Success was further advanced by written instructions, left by the developers for the community. When support was not available, the community members were able to fix simple components of the system without physical technical support (Gamos, 1999).

- Research from experiences with household photovoltaic systems in Indonesia, Sri Lanka, The Philippines, and The Dominican Republic reveals important issues on the successes and lessons learned from these projects. The necessity of documentation is stressed, noting that the following are integral parts of an installed system's paperwork: a technician's manual describing the system and its maintenance, a list of tools and parts to be stocked, logbooks, warranty and loan agreements, and user manuals. Also, those responsible for system care should be educated about system usage, costs they may incur, and the limits of the system (Cabraal, Cosgrove-Davies, & Schaeffer, 1996).

Discussion and Conclusions

Community involvement is the core of successful technology integration in indigenous communities. These findings show that the people using a technology are the ones whose views and understandings are most essential. The fact that so little information exists discussing technology integration to indigenous peoples invites discussion as to why this is so. Clearly, more studies are necessary to acquire more information to address this topic more thoroughly in the future.

When attempting to bring technology to a community, one must not assume that the people want the technology. For example, the electricity brought to Cekeza in South Africa, and the wind generators in Inner Mongolia were both accepted by the communities, and were also successful. On the other hand, Forsgren told of the Sami objections to new energy sources. The Dene, who complained of television's effects, also objected to its arrival. This does, however, shed light on the fact that while it may at first be unfavorable, communities are likely to slowly accept the technology, witnessed by the facts that the Samis have at least limited email and

Internet access, and many of the Dene families own a television. For quickest adoption and acceptance, community surveys should be conducted to understand the desires of the people.

After establishing a desire, the planning stage is critical. The involvement of the end users in the planning of the technology provides unmatched insight into things such as proper location of the technology, user expectations, cultural boundaries, lifestyle of the community, and other factors critical to installation of equipment. Examples of this are meetings between the ITDG and the Yaa Galbo, the success of PV in Kenya based on meetings with the Kenyans, and the Ethiopian women assisting in the production of the mirte stoves. Additionally, meetings such as those with the Mentawaian peoples allow the developers to understand the space they have to work with, understand the layout of the land, and see up front what will and will not be suitable for the community.

Conversations with the end user about user expectations are critical. A developer must be honest with the people to whom he attempts to sell a product. If user expectations and the developers' ideas are unaligned, consumer dissatisfaction is sure to result, likely leading to failure of the project.

Once a technology has been implemented, training and instruction are critical for success. With post-implementation training, community members will understand how to help troubleshoot and correct problems when technical support is not available. Again, the mirte stoves in Ethiopia are an example. Produced and installed by women who use them, the community is assured local assistance. With the successful wind power project in Inner Mongolia, written instructions were provided, allowing individual owners to fix minor problems on their own. Less direct evidence of the importance of user training is seen in the PV systems in Kenya. When the systems are not functioning due to poor batteries and broken light bulbs, the

fact that few households blame the PV, instead realizing the limits of the system components, proves that owners must have received some training and have an understanding of the system.

It is clear from this study that while some conclusions may be drawn, little research has been done in this area. When asked for assistance in this matter, Rodney Bobiwash, Director of The Forum for Global Exchange at the Center for World Indigenous Studies (CWIS) said, after noting its importance, "Unfortunately…I can think of nobody or of any Indigenous group which is specifically dealing with this phenomenon" (email, July 27, 2000). We must determine why this is so. Developers seldom published papers on their failures highlighting the lessons learned from them. The lack of studies on indigenous peoples suggests apathy towards them from the developed world. Whatever the reasons, more studies are essential so we can learn from both success and failure, and bring sustainable technologies successfully to indigenous peoples that desire them.

Acknowledgements

I would like to thank the United States Department of Energy – Office of Science for providing me the opportunity to participate in the Energy Research Undergraduate Laboratory Fellowship Program.

Thanks go also to my mentor Ian Baring-Gould and Larry Flowers for their assistance with this project. Mara Sprain in the NWTC library provided endless assistance with database searching, and everyone at the NREL library assisted me by tracking down all of my sources. Linda Lung, Education Program Coordinator, deserves thanks for her guidance through my entire research experience.

References

Acker, R.H., & Kammen, D.M. (1996). The quiet (energy) revolution: Analysing the dissemination of photovoltaic power systems in Kenya. *Energy Policy*, 81-111.

Annecke, W. (1999). Non-economic determinants of energy use in rural areas of South Africa. *ETDEWEB*. (Document #6706). (15 June 2000).

Cabraal, A., Cosgrove-Davies, M., & Schaeffer, L. (1996). *Best practices for photovoltaic household electrification programs: Lessons from experiences in selected countries*. World Bank Technical Paper Number 324. Washington, D.C.: The World Bank.

Durning, A.T. (1993). Supporting indigenous peoples. In L.R. Brown, C. Flavin, S. Postel, and L. Stark (Dir. and Eds.), *State of the world 1993* (pp. 80-100). New York: W.W. Norton & Company, Inc.

Flowers, L. (1997). Renewables for sustainable village power. Presented at the International Conference of Village Electrification through Renewable Energy, New Delhi, India, March 3-5, 1997. Retrieved July 21, 2000 from the World Wide Web: http://www.nrel.gov/villagepower/program/overview.html

Gamos Ltd. (1999). Technology Transfer: Evaluating the impact of wind generators in Inner Mongolia. Retrieved July 14, 2000 from the World Wide Web: http://www.gamos.demon.co.uk/nigels/imwweb.htm

Linquist, B.J., and Adolph, D. (1996). The drum speaks – are we listening? Experiences in development with a traditional Gabra institution – the Yaa Galbo. In Blunt, P, and Warren, M.D. (Eds.), *Indigenous Organizations and Development* (pp1-6). London: Intermediate Technology Publications, Ltd.

Mander, J. (1991). *In the absence of the sacred: the failure of technology and the survival of the Indian nations*. San Francisco: Sierra Club Books.

Mirte Stoves in Ethiopia (20 April 1998). Retrieved June 26, 2000 from the World Wide Web: http://nt.oneworld.org/cfdocs/tve/ho/printable.cfm?aid=240.

Scott, N., Batchelor, S., Daoqi, L. (December 1999). Delivery mechanisms for small wind generators in Inner Mongolia. *Renewable Energy for Development – Stockholm Environment Institute – Newsletter of the Energy Programme*, 1-6.

Swasono, M.F., (1997). Indigenous Cultures in the Development of Indonesia. New Delhi: Indira Gandhi National Centre for the Arts. Retrieved June 26, 2000 from the World Wide Web: http://www.ignca.nic.in/cd_05008.htm.

Table 1. Summary of the lessons learned from each project cited in the report. "Organization" refers to the organization the author wrote for, if known.

Technology	Location	Organization	Lessons Learned
Animal Health	Kenya	Intermediate Technology Development Group (ITDG)	▪ Cultures successful for their own reasons. Respect community and its rituals. ▪ Discussion with community fosters understanding on both sides.
N/A	Siberut Island (Mentawaian community)	Indira Gandhi National Centre for the Arts	▪ Importance of anthropological studies in development. ▪ Culture is important – it must be accepted and respected.
TV	Canada (Dene community)	N/A	▪ Success depends on the social reactions of the people, not just on the technology
Video	Australia (various)	University of Melbourne (Brett Westblade)	▪ Development can change social structure.
Electricity (off-grid)	Maphephetheni (South Africa)	Energy and Development Research Centre (U. of Cape Town)	▪ Determine the desires of the people first to confirm the technology will aid them the way the expect. ▪ Lighting is valued for education.
Electricity (grid connected)	Cekeza (South Africa)	Energy and Development Research Centre (U. of Cape Town)	▪ Usefulness is limited by availability of other resources.

Technology	Location	Organization	Lessons Learned
PV	Kenya	N/A	▪ Factors contributing to use: domestic production, decreasing world PV prices, slow grid connection. ▪ Factors hindering use: politics, increased local prices, inflation.
Mirte stoves	Ethiopia	Unknown	▪ Involvement of the users in production my lead to success.
Stand-alone wind systems	Inner Mongolia	Gamos, Ltd.	▪ Feedback loops are essential. ▪ Success takes time. ▪ Communication between everyone from the users to the producers is essential. ▪ Written documentation promotes continued system function.
Household PV	Various	World Bank	▪ Documentation necessary. ▪ User education should target family member responsible for system care. ▪ System limits and future costs should be made clear to avoid disappointment. ▪ Communication is important.